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Design of a Software System to Support Value Education in Sports Through Gamification Techniques

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Nowadays, it is quite common to find violent acts in grassroot sports, such as football. Almost every week, it is possible to find news about team supporters fighting against each other, or football players arguing aggressively to the referee. And the worst part in this story is that most of these acts are watched by children. In order to alleviate this situation and create awareness of the necessity to create educational programs to prevent violence in sports, the European Union has funded several projects focused on this area. One of this project is called SAVEit project, and its goal is to create and develop innovative educational tools to promote values in grassroot sports. This paper presents the software architecture designed in SAVEit project to achieve this goal. This architecture is mainly composed of a Learning Management System, where coaches will learn about the values; a Team Management Site, where coaches can evaluate the values acquired by the children of the teams; and finally, a Video Game that using gamification techniques will keep the motivation of children during the learning process.

Keywords: Sports Values; Learning Management System; Video Game.

1. Introduction

In recent years, there has been an increasing concern about the violence, intolerance and discrimination around the sports.[1] Almost every day we can see in the mass media and social networks news like: “fans are expelled from a stadium accused of violent acts”, “a father who has insulted or beaten referees” or “fights and insults

between football players". This type of situations are conveying a negative and incorrect view of the values that should be transmitted within sports.

Sports have always been considered as entertainment activities, for this reason it is necessary to design innovative approaches to teach values and keep the children motivated. However, there has been a great discussion about the need to program activities to teach values. In this sense, there are two main groups of opinions: some researchers claim that sports activities do not generate values organically, thus the transfer of values depends on the teaching methodology and the conditions in which it has been developed.[2–5]

However, other researchers demand that sports activities naturally lead to the establishment of values (for example, social power, sportsmanship and fair play, expression of feelings, companionship, etc.). However, this can include both positive and negative values, such as violence, manipulation, cheating, etc.[6,7]

In this discussion, we agree with those researchers who believe sports can be used in the establishment of values in children. And also, the European Union (EU) conceives in the same way, because it has launched several initiatives to create awareness of the necessity to develop educational programs to prevent the violence and radicalization in sports.

In this context emerges the SAVEit project.[a] This project was born with the idea that the best way to tackle these problems is through education.[8] The main goal of this project is to support educational and innovative approaches to prevent and reduce violence and intolerance in the grassroot sports, especially in football, although its results and impacts could be transferred to other sports.

There are other examples of the positive effects of organized sports community programs such as the Sporting Youth Project[9] that implemented a sports intervention to reduce youth crime and anti-social behavior. The results showed that the project helped participants to develop leadership skills, which they recognized as being vital not only for success in sports, but also in other social fields such as education, training and employment.[9]

The goal of this paper is to present, and describe, the software architecture of the system developed in SAVEit project. This system consists of a gamification[10] approach to promote sports values and to keep students motivated during the learning process. Moreover, there have been little works related to the use of video games as resources to teach values in the field of sports, so this could be an innovative mechanism for teaching values.

This paper is structured as follows: Section 2 provides a review of the potential of video games in physical education. Then, we present the steps carried on in this project to build the methodology in Sec. 3. In Sec. 4, we describe the system architecture built in SAVEit project and its different components. Finally, some conclusions and future works are discussed in Sec. 5.

[a]http://www.saveitproject.eu/saveit/.

2. Potential of Video Games in Physical Education and Sports

Traditionally, sports values have been associated with competition, health, personal motivation, equality, the spirit of justice, the pursuit of victory, etc.[3,11] Nevertheless, all these values can also be developed where children play video games. In this section, we analyze some commercial sports video games and how they can be used in the physical education and sports to transmit values.

The use of video games, as an educational resource for teaching physical education, has grown in the recent years. As a consequence, the number of research works that use video games with these purposes has increased.[12–14] Studies indicate that video games in the field of physical education, and sports, can be used to improve spatial abilities, knowledge structures, visual selective attention and problem-solving skills.[12] Most of the literatures related to video games, and physical education, are focused on the use of commercial off-the-shelf (COTS) games. This type of games offer a realistic simulation environment of a popular sport (football, tennis, etc.) to train in sports rules, team management, enhance student's motivation and performance in athletic activities. But there are also other games, for example the *exergames*, that promote physical exercises like muscle toning exercises and interactive aerobic exercises.[14] Young *et al.* (2012) showed some examples of how exergames can be used in physical education.[15]

As it has been said, there are different categories of sports video games. So far, we have introduced simulation games and exergames, but there are four different categories: simulation, arcade, direction or sports management and exergames.[14] Table 1 contains the definition of each type of game, some examples of well-known video games belonging to each category and finally, the potential skills that can be gained.

From the set of video games described in Table 1 it is worth to highlight the video game titled *NBA Live 07*. This simulation game was used as an educational resource in a primary school classroom.[16] The just mentioned work proposed a workshop divided into four different phases, which could be applied for using in any other sports video games. These 4 steps are as follows:

Introduction. Explanation on what the activity will consist of and why the video game would be used as an educational tool. It is important to clarify that the activity is not just about playing the video game, but that children should also think about the game.

Playing. To play the video game and think about the relationship between the rules of the virtual game and the real one.

Sharing. Students have to publish and express their opinions about the video game in different social media.

Evaluation. To evaluate and collect all the activities by creating a poster to disseminate the workshop activity.

Table 1. Categories of sports video games and their educational potentials.[15]

Type of video game	Definition	Game examples	Skills developed
Simulation games	Designed to closely simulate aspects of a real, or fictional, reality.	EA Sports FIFA, Madden NFL, NBA 2K series, NBA Live	Decision-making, analysis of actions and strategies, learning about sports terminology, rules, specific sport techniques and sport tactics, teamwork and encouragement for interpersonal relationships.
Arcade	Arcade games often have short levels, simple and intuitive control schemes and rapidly increasing difficulty.	NFL Blitz, NBA Jam, Virtual Tennis 1999	Learning about sport terminology, rules, techniques, problem solving, decision-making, tactical reflection, cooperation and fine motor development.
Management sports	Put players into the role of team manager, where players are expected to handle strategy, tactics, transfers and financial issues	Football Manager, SimLeagues, Comunio, World Basketball Manager	Decision-making, social and financial responsibility, problem solving, sports terminology, knowledge of specific sport techniques, developing and testing hypotheses.
Exergames	Interactive video games that enhance and motivate physical activity through technologies that monitor the movements of the body.	Wii Fit, EA Sports Active, Dance Dance Revolution.	Improved gross and fine motor skills, eye–foot and eye–hand balance and coordination.

This is an example on how to use video games to learn about sports terminology, rules, specific sport techniques and sport tactics and also develop decision-making skills and teamwork. But, this work is concerned about the promotion of other values like tolerance, sportsmanship, concern for others, etc. For this reason, we have developed a learning methodology based on gamification to promote and motivate children during the learning process, and make them act according to certain values taught by their coaches.

3. Gamification Approach to Promote Sports Values

The innovative aspect of this research consists in the design of a new gamification approach that uses a football video game to motivate children to learn different values. But before describing the different system components, this section describes the designed methodology for learning values.

Gamification is a novel concept that has increased its popularity in the last years. It was developed in the industry in 2008, although it was not until 2010 that the adoption became widespread. The first documented use of the term gamification was in 2008 and this concept was defined as the use of game design elements, in nongame

contexts, with the intention of increasing the participation of a person and motivate him/her to learn something or introduce new behavioral patterns.[17]

The implementation of this type of technologies in education has provided positive results due to children feeling more motivated to complete the activities or challenges proposed.[18,19]

Being aware of the potential of video games as an educational tool, the goals of SAVEit project are: (1) to develop a learning methodology to teach sports values; (2) to design a gamification strategy to motivate the children to learn these values; and (3) to modify the children behaviors in a positive way. In order to meet all these goals, the designed methodology is composed of the following steps:

Search and define relevant values in sports. The first step focuses on the identification of prevalent values in team sports. It has been identified a set of 25 values extracted from the state of the art.[20–22] In order to limit this number, we have conducted an online survey for the coaches where they had to define which are the most important values for them and what would be the appropriate number of values to teach during training sessions. The results provided a set of 11 values, grouped into five categories: Respect, Companionship, Order, Healthy habits and Coexistence. Taking into account these categories, we have built the training materials.

Design an online course for the coaches. In the second step, a learning management system has been developed. The goal is to provide coaches and club leaders the necessary tools to develop a program on education values through sports. Each module will be composed of the following parts: (1) a theoretical content about the value to be developed; and (2) a set of activities to develop each value.

Online course. Coaches take the online course and put into practice the different activities and knowledge acquired in the learning management system. In these courses, coaches will learn about the values, how to measure the acquisition of the value, which are the consequences of not having this value, etc.

Evaluation. Finally, in the last step of the methodology, coaches need to evaluate the level in which children exhibit the values explained in the class. It is important to highlight that this evaluation is based not only on the behavior of the children in the class, but also on the behaviors during the training sessions, real matches, etc.

Finally, once the methodology has been described, next section provides a description of the software system developed to put this project into practice.

4. System Development

In this section we describe the software architecture designed to build the system described in this work. This software architecture is shown in Fig. 1 and it is composed mainly of four components:

Learning Platform. To provide coaches the information needed to communicate the different values to the children.

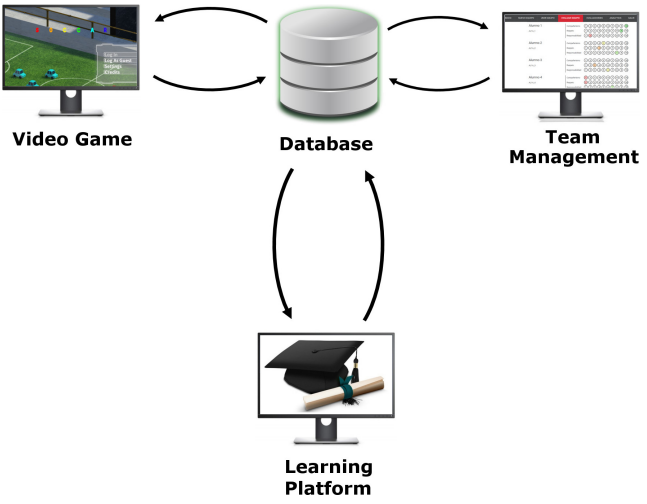

Fig. 1. The developed software architecture.

Team Management. This subsystem is in charge of managing all the teams, and children, who work with the system.

Video Game. The gamification video game designed to engage children to learn the different values.

Database. The place where all the information about the system is stored.

From now on, we will describe and analyze all the main components in the same way as users will interact with them.

4.1. *Learning platform*

The first step of the whole process is to provide coaches the concepts, explanations and tools needed to promote values among the children. These tasks are carried out by the Learning Platform module, where coaches need to take a value course.

There are some requirements that this Learning Management System (LMS) has to fulfill. For example, it must support the concurrent access of users to the contents; it must provide the content in an accessible and interesting way; it is interesting that the LMS allows the inclusion of different data sources, not only texts but also videos, audios, etc. And finally, we need that the LMS is able to create tasks, challenges or questionnaires to realize whether the coaches have acquired the competences.

In this work, the LMS selected has been Moodle.[b] The reasons are the following: this LMS satisfies all the requirements just explained, it is very popular and it has a strong community working with this platform.

In this LMS, we have created a course (in different languages) composed of different modules, each of them representing a different value. The idea is that each module

[b] https://moodle.com/.

contains at least the definition of the value, examples of good (and bad) practices of this value, how to measure this value from the behavior of the children, which are the consequences of this value and how to promote this value among the children.

At the end of each module, coaches need to fulfill a questionnaire to ensure that they have understood correctly the studied value. And at the end of the course there is a final exam that will confirm that coaches have acquired the competences of this course.

4.2. *Team management*

The second phase of the process corresponds to the creation of the different teams and the children that belong to them.

When the different coaches create their teams, they do not only have to create the team and its children, but also have to specify the different values that they are going to work with.

Once the team is created with its corresponding users and the different values, it is time to evaluate the values shown by the students. As can be observed in Fig. 2, the coaches have to evaluate the different values of different kids in a scale of 1–10 where 1 is the absence of the value and 10 means that the child understood the value and uses it correctly every day.

4.3. *Video game*

The big challenge of this work is how to engage children to learn values, because values are really important in any society, but we need to develop techniques that prevent children from getting bored during the learning procedure.

In this sense, and as it has been mentioned before in this paper, we have decided to develop a video game that will maintain the engagement of the children thanks to gamification techniques.

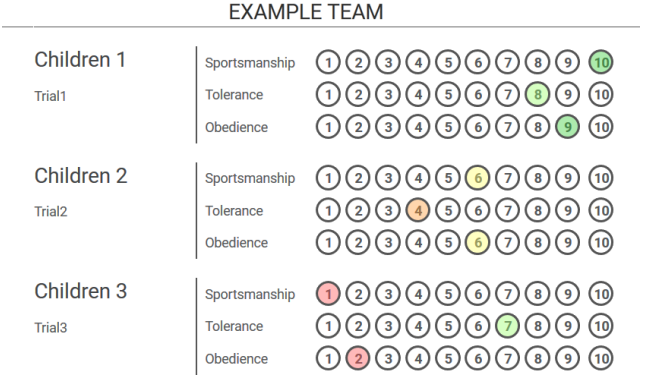

Fig. 2. Schematic of the evaluation form where the different coaches will evaluate the acquisition levels of the different values.

Fig. 3. Screenshot of the video game designed.

The game developed is a football game where the children have to play different matches against the bots (see Fig. 3). The goal of this football video game is to win the match by scoring more than the enemy team.

The gamification technique used in this game to keep the students motivated is in charge of transforming the behavior evaluation performed by the coaches (see Fig. 2) into skill points that the children must distribute into several characteristics of their virtual teams (see Fig. 4).

It is important to note that the evaluation performed by the coaches is based on the children's behavior in the real, e.g., this evaluation is based on how the kids behave during the training sessions, in the matches, etc. If they behave according to the values learnt, they will be evaluated higher and they will have more points

Fig. 4. This figure shows how the children can distribute their points into several characteristics that will affect the behaviors of the bots of their teams.

to assign to their virtual team. Finally, if their team has more points, it will be more powerful and it is more likely to win the matches of the video game.

Also all the members of the real team will belong to a virtual league. In this way, the video game can show the classification table of this league. Therefore, children will have also another reason to behave well in real life: they can win their teammates in the virtual league.

5. Conclusions and Future Work

In the last years, violent acts in football pitches have grown drastically. It is quite common to find violent act, almost every week, among football players, team supporters, etc. Moreover, some of these acts are watched by children, because they are watching the TV at this moment, or because they are in the football pitch.

The European Union is worried about this problem and it has launched several initiatives to reduce the violence in grassroot sports. In this sense, the EU has not only launched several programs to raise awareness about the problem, but also launched several calls to fund projects focused on this topic. The goal of these calls is to create awareness of the necessity to create educational programs to prevent the violence and radicalization in sports.

One of these initiatives funded by the European Union is "SAVEit: Saving the dream of grassroots sport based on values". The goal of this project is to create and develop innovative educational tools to promote the recognition of sports values and a healthy environment in grassroot sports.

This paper describes the software architecture built in SAVEit project to achieve the just mentioned goal. The above-mentioned architecture is composed of three main components:

Learning Management System. Here the coaches have to acquire the required knowledge about the values. They will learn how to measure them, how to evaluate whether a child has a specific value or how to promote these values in the children, among others.

Team Management. In this site, coaches can create their teams with their children, and also, they can evaluate the acquisition level of the values by the children.

Video Game. Finally, we have created a video game for the children. This video game is in charge of keeping the motivation of the children because the performance of his/her virtual team will be affected by the child's behavior in real life. This means that if the child shows good values during training sessions and real matches, he/she will be evaluated high by the coach in the Team Management, and then, the skills of his/her virtual team would be better.

In the oncoming months, the SAVEit project starts the *deployment phase* where several football teams are going to use this platform. For this reason, the future work

is mainly focused on the analysis of the opinions of coaches and children about the Learning Management System, the Team Management and the Video Game.

Acknowledgments

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